

# Department Circular DEQ-14

## Performance-based Methods and Methodology

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### Part A: Performance-based Methodology

#### Introduction

This document is intended to assist in developing a consistent, transparent, and scientifically-defensible approach for developing performance-based methods. Performance-based methods are defined as follows:

Performance-based method: An adopted water quality standard that is a specific process and methodology leading to and describing implementation of a numeric water quality criterion. It may be used for the derivation of site-specific numeric criteria or for interpreting narrative criteria into quantifiable measures.

EPA's current national policy regarding the establishment of site-specific natural background criteria requires that states and tribes include the following in their water quality standards (EPA, 1997):

- 1) A definition of natural background consistent with EPA's (see section XX, below)
- 2) A provision that site-specific criteria may be set equal to natural background (see MCA 75-5-222)
- 3) A procedure for determining natural background, or alternatively, a reference in water quality standards to another document describing the binding procedure that will be used.

This document serves to fulfill EPA's requirements under 3) above.

#### Definition of Nonanthropogenic

MCA 75-5-222 prohibits implementation of a standard in assessments or permits that is purer than the "nonanthropogenic" condition of the water body. It further states that if a standard is less than the nonanthropogenic condition of the water body, then the nonanthropogenic condition becomes the standard.

New rules implementing MCA 75-5-222 define "nonanthropogenic condition."

Nonanthropogenic condition: the background concentration of a parameter in surface water or groundwater due only to non-anthropogenic sources, i.e., non-human induced sources.

There are two acceptable approaches to deriving site-specific criteria based on the nonanthropogenic condition of a waterbody:

- 1) Determine and adopt site-specific criteria on a site-by-site basis as necessary. This approach is best suited to parameters that do not cause widespread concern but are limited in scope.
- 2) Develop a performance-based method for a parameter or group of parameters. This approach is best suited to parameters that are of widespread concern, such as iron, aluminum, electrical conductivity, and sodium adsorption ratio. These parameters are naturally elevated across much of Montana because of the geology in those areas.

The sections below detail questions to be asked prior to developing a performance-based method, data needs for the performance-based approach, acceptable methods for determining the non-anthropogenic condition, and necessary considerations in calculating of the final water quality criterion.

Part B of this document houses performance-based methods developed for specific parameters.

### **Background questions to determine applicability of site specific criteria for a water body**

These questions will be asked about any water body for which site specific criteria are being considered to determine if development of site specific criteria is appropriate.

1. Are the water quality standards met in the waterbody?  
If yes, then site specific criteria are not appropriate.

If no:

- a. Could the current standards be met with cleanup or in the absence of anthropogenic sources?  
If yes, then site specific criteria are not appropriate.

- b. Are the designated uses appropriate for the stream?

If no, then a Use Attainability Analysis (UAA) should be conducted prior to or concurrent with development of site specific numeric water quality criteria.

- c. Do the standards fit within the non-anthropogenic distribution of values? (i.e., would simple changes to the standards in the form of a more appropriate duration and frequency be appropriate rather than a change in magnitude?)

If yes, then consider adjusting the water quality criteria by changing only the frequency and/or distribution.

### **Data needs**

The nonanthropogenic condition is a long-term condition—a distribution of values, not a single number. In order to fully characterize the nonanthropogenic condition of a water body, the data gathered must be sufficient to define the following characteristics of the waterbody or waterbodies:

1. All beneficial uses of the waterbody(ies) must be clearly described.

A performance-based approach will ultimately derive water quality criteria based on the nonanthropogenic condition of a waterbody. However, the number selected must be protective of the most sensitive designated use.

2. Parameter concentration and flow data collected must reflect seasonal and temporal variability within the waterbody.

There may be a seasonal component to the most sensitive uses in a water body, whether the most sensitive use is aquatic life, agriculture, recreation, or another use. Samples collected from the water body must be representative of seasonal fluctuations.

3. Parameter concentration and flow data collection points must be sufficiently spaced to appropriately represent the spatial boundaries of the waterbody or waterbodies of concern and fully characterize the conditions within the waterbody or waterbodies.

Determine availability of data and differences in values along the stream. If more data is necessary, lay out requirements for sampling. Sufficient data should be collected to determine if only a portion of the water body needs site specific criteria or if multiple segments will require different site specific criteria.

4. All potential anthropogenic contributions of the parameters must be described.

If necessary, a study plan must be developed for collection and analysis of data described above.

1. Develop data collection approach

Spatial

Temporal

Quality Assurance

Collect data as described in study plan

2. Develop data analysis approach

Analyze data as described in study plan

#### Demonstration of nonanthropogenic

The non-anthropogenic condition of a waterbody may be determined through modeling, comparison to an appropriate reference site, mass balance loading, or other methods determined appropriate by the department and the board. The study plan should describe collection of sufficient data and analysis of that data to determine the nonanthropogenic condition of the parameter in the water body. Acceptable methods of determining the nonanthropogenic condition of a waterbody include modeling, a reference

stream approach, mass balance modeling, and other methods approved by DEQ and the Board of Environmental Review.

#### Selection of a criterion

Site-specific criteria calculations will be based only on the non-anthropogenic condition of the waterbody, excluding all contributions from anthropogenic sources. Beneficial use protection will be considered when determining an appropriate method of calculating the site-specific criteria.

#### Implementation

The performance-based method must include, in addition to data needs and a specific calculation to derive site-specific criteria, specific procedures for implementation of the resulting water quality criteria including provisions that ensure protection of downstream water quality standards.

Implementation in the following must be described

- Beneficial use assessments
- Effluent limit calculations
- Total maximum daily load calculations
- Remediation requirements
- Other activities as appropriate

### References

EPA, Memo from Tudor T. Davies. "Establishing Site Specific Aquatic Life Criteria Equal to Natural Background." November 1997.

## Part B: Performance-based Methods